(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 110 120 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.12.2016 Bulletin 2016/52

(51) Int Cl.:
H04N 1/00 *(2006.01)* ***H04N 1/32*** *(2006.01)*
G06F 3/12 *(2006.01)*

(21) Application number: **16171761.6**

(22) Date of filing: **27.05.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **25.06.2015 JP 2015127243**

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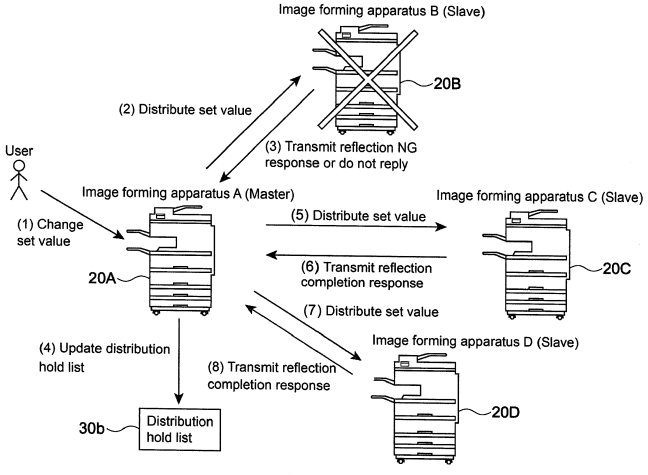
(54) IMAGE FORMING APPARATUS THAT ENSURES EXECUTION OF ASYNCHRONOUS INFORMATION SHARING WITHOUT USING MAIL SERVER, IMAGE FORMING METHOD AND RECORDING MEDIUM

(57) An image forming apparatus (20) that is adapted to execute information sharing among a plurality of image forming apparatuses (20A, 20B, 20C, 20D) includes a communication circuit (29), a set value management circuit (21a), a storage circuit (30), and a distribution hold list management circuit (21b). The communication circuit (29) is adapted to ensure communication with another image forming apparatus of the plurality of the image forming apparatuses (20A, 20B, 20C, 20D). The set value management circuit (21a) is adapted to distribute, based on a master authority as an authority for distributing a changed set value to the other image forming apparatus, the changed set value to the other image forming apparatus. The storage circuit (30), when the distribution fails, is adapted to store a distribution hold list (30b) that includes a combination of: an identifier of another image forming apparatus, where the distribution has failed, and an item name and value of a set value, where the distribution has failed. The distribution hold list management circuit (21b) is adapted to manage the stored distribution hold list (30b).

FIG. 1



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Description

BACKGROUND

[0001] Unless otherwise indicated herein, the description in this section is not prior art to the claims in this application and is not admitted to be prior art by inclusion in this section.

[0002] There has been variously contrived information sharing between a plurality of typical image forming apparatuses in a network to which the plurality of the typical image forming apparatuses (Multifunction Peripheral (MFP)) are connected.

[0003] For example, there is proposed a technique, where a plurality of image processing apparatuses connected to a network are separated into an image processing apparatus assumed as a master and an image processing apparatus assumed as a slave, and executes mutual communication.

[0004] This technique ensures information sharing among the plurality of image processing apparatuses without using a server that controls the information sharing.

[0005] For example, for information sharing among a plurality of information holding devices connected to a network, when a part of the devices is turned off, there is proposed a technique that achieves asynchronous information sharing by transmitting an e-mail to the turned-off device.

SUMMARY

[0006] An image forming apparatus that is adapted to execute information sharing among a plurality of image forming apparatuses according to one aspect of the disclosure includes a communication circuit, a set value management circuit, a storage circuit, and a distribution hold list management circuit. The communication circuit is adapted to ensure communication with another image forming apparatus of the plurality of the image forming apparatuses. The set value management circuit is adapted to distribute, based on a master authority as an authority for distributing a changed set value to the other image forming apparatus, the changed set value to the other image forming apparatus. The storage circuit, when the distribution fails, is adapted to store a distribution hold list that includes a combination of: an identifier of another image forming apparatus, where the distribution has failed, and an item name and value of a set value, where the distribution has failed. The distribution hold list management circuit is adapted to manage the stored distribution hold list.

[0007] These as well as other aspects, advantages, and alternatives will become apparent to those of ordinary skill in the art by reading the following detailed description with reference, where appropriate to the accompanying drawings. Further, it should be understood that the description provided in this summary section and elsewhere in this document is intended to illustrate the claimed subject matter by way of example and not by way of limitation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 illustrates an outline of creating or updating a distribution hold list by a plurality of image forming apparatuses according to one embodiment of the disclosure;

FIG. 2 illustrates a concrete example of the distribution hold list according to the one embodiment;

FIG. 3 illustrates an outline of transferring the distribution hold list, when another image forming apparatus is a master;

FIG. 4 illustrates an outline of distributing a held set value to an image forming apparatus that has returned to a ready state;

FIG. 5 illustrates a configuration of the image forming apparatus according to the embodiment of the disclosure;

FIG. 6 illustrates a process of the master, when a set value of the master is changed, and the master distributes the set value;

FIG. 7 illustrates a process of a slave, when the master distributes the changed set value of the master;

FIG. 8 illustrates a process of the image forming apparatus that distributes a changed set value, which is changed, when the image forming apparatus is the slave, after the image forming apparatus has become the master;

FIG. 9 illustrates a process of the image forming apparatus that transitions from the master to the slave due to a change of a set value and a master request;

FIG. 10 illustrates a process of the slave to which the image forming apparatus, which has become the master due to the change of a set value, distributes the set value;

FIG. 11 illustrates a process of the slave that has returned to the ready state and receives the set value for which a distribution is held; and

FIG. 12 illustrates a process of the master that distributes the set value, for which the distribution is held, to the slave that has returned to the ready state.

DETAILED DESCRIPTION

[0009] Example apparatuses are described herein. Other example embodiments or features may further be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented herein. In the following detailed description, reference is made to the accompanying drawings, which form a part thereof.

[0010] The example embodiments described herein are not meant to be limiting. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the drawings, can be arranged, substituted, combined, separated, and designed in a wide variety of different configurations, all of which are explicitly contemplated herein.

[0011] The following describes embodiments of the disclosure with reference to the drawings.

Outline

[0012] First, the following describes an outline. FIGS. 1 to 3 illustrate the outline of the disclosure.

Creation or Update of Distribution Hold List

[0013] First, the following describes an outline of creating or updating a distribution hold list. FIG. 1 illustrates the outline of creating or updating the distribution hold list.

[0014] FIG. 1 exemplary illustrates four image forming apparatuses (20A, 20B, 20C, and 20D) according to the embodiment of the disclosure. These image forming apparatuses are communicative with one another via a network.

[0015] As illustrated in FIG. 1, assuming that the image forming apparatus 20A is a master, the image forming apparatus 20B is not in a ready state due to, for example, power supply off. The ready state is a state, where the image forming apparatus normally operates.

[0016] In the following description, a master authority, that is, an image forming apparatus with an authority for distributing a changed set value to another image forming apparatus is referred to as a master. An image forming apparatus without the master authority is referred to as a slave.

(1) First, assuming that a user goes to the image forming apparatus 20A to change a set value.

(2) Since the image forming apparatus 20A has the master authority, the image forming apparatus 20A starts distributing the set value changed by another image forming apparatus in a network based on an image forming apparatus list 30a (see FIG. 5) included in the image forming apparatus 20A itself.

[0017] In this example, assuming that the distribution of the changed set value to the image forming apparatus 20B is attempted first.

(3) Since the image forming apparatus 20B is not in the ready state, the image forming apparatus 20B replies a fact of a reflection failure of the set value to the image forming apparatus 20A, which is the master (a reflection NG response), or does not reply.

(4) The image forming apparatus 20A, which is the master, detects the reflection failure of the set value in the image forming apparatus 20B and records the image forming apparatus 20B and a set content, which has not been distributed to the image forming apparatus 20B, in a distribution hold list 30b (described below).

(5) Next, the changed set value is distributed to the image forming apparatus 20C.

(6) Since the image forming apparatus 20C is in the ready state, the distributed set value is appropriately reflected, and the image forming apparatus 20C transmits a reflection completion response.

(7) Next, the changed set value is distributed to the image forming apparatus 20D.

(8) Since the image forming apparatus 20D is in the ready state, the distributed set value is appropriately reflected, and the image forming apparatus 20D transmits a reflection completion response.

[0018] The above is the outline of creating or updating the distribution hold list 30b.

Distribution Hold List

[0019] Here, the following describes a concrete example of the distribution hold list 30b.

[0020] FIG. 2 illustrates the concrete example of the distribution hold list 30b.

[0021] The distribution hold list 30b stores a name (an identifier) of an image forming apparatus for which a distribution and a combination of a name of a setting item, which the distribution is held, and a set value are held.

[0022] In the example illustrated in FIG. 2, an entry ex1 indicates a held distribution for changing a value of a setting item X to "A4" with respect to the image forming apparatus 20B.

[0023] An entry ex2 similarly indicates a held distribution for changing a value of a setting item Y to "100" with respect to the image forming apparatus 20B.

Transfer of Distribution Hold List

[0024] Next, the following describes an outline of transferring the distribution hold list, when another image forming apparatus becomes the master. FIG. 3 illustrates the

outline of transferring the distribution hold list, when another image forming apparatus becomes the master.

(1) First, assuming that a user goes to the image forming apparatus 20C to change a set value.

(2) The image forming apparatus 20C, for which the set value has been changed, transmits a master request for transferring the master authority, to the image forming apparatus 20A, which is the present master, to distribute the changed set value to another image forming apparatus.

(3) The image forming apparatus 20A, which has received the master request, transfers the master authority to the image forming apparatus 20C.

(4) The image forming apparatus 20A itself has the distribution hold list 30b and additionally transmits the distribution hold list 30b to the image forming apparatus 20C. After the transmission, the image forming apparatus 20A switches itself to the slave from the master.

[0025] The above is the outline of transferring the distribution hold list, when another image forming apparatus is the master.

Distribution to Slave that Has Returned to Ready State

[0026] Next, the following describes an outline of distributing a held set value to an image forming apparatus that has returned to the ready state. FIG. 4 illustrates the outline of distributing the held set value to the image forming apparatus that has returned to the ready state.

(1) First, assuming that the image forming apparatus 20B returns to the ready state.

(2) The image forming apparatus 20B, which has returned to the ready state, transmits a ready notification indicating a fact that the image forming apparatus 20B has returned to the ready state to notify the image forming apparatus 20C, which is the master, of the fact. The ready notification is a notification indicating a fact of a return to a normal state. The ready notification may be transmitted with broadcast or multicast, and may be transmitted to an image forming apparatus, which is individually specified as the master.

(3) The master, which has received the ready notification, transmits a ready response.

(4) The master refers to the distribution hold list 30b to distribute a set value, for which a distribution has been held, to the image forming apparatus 20B, which has returned to the ready state.

(5) The image forming apparatus 20B executes a reflection of the distributed set value and transmits a reflection completion response.

(6) The master, which has received the reflection completion response, deletes an entry regarding the image forming apparatus 20B from the distribution hold list 30b.

[0027] The above is the outline of distributing the held set value to the image forming apparatus that has returned to the ready state.

[0028] The above has described the outline.

Configuration

[0029] Next, the following describes a configuration of an image forming apparatus according to the embodiment of the disclosure. FIG. 5 illustrates a configuration of an image forming apparatus 20 according to the embodiment of the disclosure.

[0030] The image forming apparatus 20 includes a control unit 21. The control unit 21 is constituted of a Central Processing Unit (CPU), a Random Access Memory (RAM), a Read Only Memory (ROM), a dedicated hardware circuit, and similar member, and manages an entire operation control of the image forming apparatus 20.

[0031] The control unit 21 is connected to an image reading unit 22, an image processing unit 23, an image memory 24, an image forming unit 25, an operation unit 27, a display 27a, a facsimile communication unit 28, a network interface unit 29, a storage unit 30, and similar unit. The control unit 21 executes an operation control of the connected respective units described above and transmits and receives a signal or data to/from the respective units. The network interface unit 29 is also referred to as a communication circuit. The storage unit 30 is also referred to as a storage circuit.

[0032] The control unit 21 controls a driving and processing of a mechanism required for execution of an operation control of respective functions such as a scanner function, a printing function, a copy function, and a facsimile transmission/reception function based on an execution instruction of a job input by a user, via, for example, the operation unit 27 or a network-connected PC.

[0033] The control unit 21 further includes a set value management unit 21a, a distribution hold list management unit 21b, a master transfer management unit 21c, and a ready notification management unit 21d. That is, when the CPU executes programs loaded in the RAM from, for example, the ROM as a non-transitory recording medium, the control unit 21 operates as the set value management unit 21a, the distribution hold list management unit 21b, the master transfer management unit 21c, and the ready notification management unit 21d. The set value management unit 21a is also referred to as a set

value management circuit. The distribution hold list management unit 21b is also referred to as a distribution hold list management circuit. The master transfer management unit 21c is also referred to as a master transfer management circuit. The ready notification management unit 21d is also referred to as a ready notification management circuit.

[0034] The set value management unit 21a detects that one of the image forming apparatuses 20 has a set value changed by the user, and the set value management unit 21a distributes the changed set value to the other image forming apparatuses 20.

[0035] The distribution hold list management unit 21b controls the distribution hold list 30b.

[0036] The master transfer management unit 21c controls a transfer of a master authority.

[0037] The ready notification management unit 21d controls an exchange related to a ready notification between the master and the slave.

[0038] The image reading unit 22 reads an image from a document.

[0039] The image processing unit 23 executes image processing for image data of the image read by the image reading unit 22 as necessary. For example, the image processing unit 23 executes image processing, such as shading correction, to improve a quality of the image read by the image reading unit 22 after image formation.

[0040] The image memory 24 has a region, where the image memory 24 temporarily stores data of a document image read by the image reading unit 22, and data as a print target to be printed by the image forming unit 25.

[0041] The image forming unit 25 executes image formation of the image data read by the image reading unit 22 or similar image data.

[0042] The operation unit 27 includes a touch panel unit and an operation key unit, which accept instruction of various operations and processing executable for the image forming apparatus 20 from a user. The touch panel unit includes the display 27a, such as a Liquid Crystal Display (LCD) including a touch panel.

[0043] The facsimile communication unit 28 includes an encoding/decoding unit, a modulation/demodulation unit, and a Network Control Unit (NCU), which are not illustrated, and executes facsimile transmission using a dial-up line network.

[0044] The network interface unit 29 is constituted of a communication circuit such as a LAN board. The network interface unit 29 transmits and receives various data to/from a device (for example, a PC) in a local area via a LAN or similar network connected to the network interface unit 29.

[0045] The storage unit 30, which is a large-capacity storage device such as a Hard Disk Drive (HDD), has an area for storing, for example, a document image read by the image reading unit 22. The storage unit 30 stores the image forming apparatus list 30a and the distribution hold list 30b.

[0046] The image forming apparatus list 30a is in a network, and is a list of the image forming apparatuses 20, which has become the master or the slave and shares a set value.

[0047] The distribution hold list 30b has been described above.

[0048] The above has described the configuration of the image forming apparatus 20.

Flow of Process 1

[0049] Next, the following describes a process of the master, when a set value of the master is changed, and the master distributes the set value. FIG. 6 illustrates the process of the master, when the set value of the master is changed, and the master distributes the set value.

[0050] First, assuming that the user changes a set value of the image forming apparatus 20 as the master (Step S1).

[0051] Next, the set value management unit 21a executes a master lock (Step S2). With the master lock, the master request is rejected even if the slave transmits a master request during the master is locked. The master lock is executed while the master is distributing a set value.

[0052] Next, the set value management unit 21a repeats a process from Steps S4 to S7 for every slave to which the changed set value is distributed (Step S3).

[0053] The set value management unit 21a determines, whether or not the distribution hold list 30b includes the slave as a distribution destination (Step S4).

[0054] When the distribution hold list 30b includes the slave (Y at Step S4), the set value management unit 21a avoids distributing to the slave, and the distribution hold list management unit 21b adds a combination of a name of the avoided image forming apparatus as the slave and the changed set value to the distribution hold list 30b and then updates the distribution hold list 30b (Step S7).

[0055] At the time, when the distribution hold list 30b has already included a combination including the identical content, the combination of the name of the avoided image forming and the changed set value is overwritten, and then the distribution hold list 30b is updated. After that, the set value management unit 21a proceeds to a process for the next slave.

[0056] As described later, the image forming apparatus 20 that has returned to the ready state is deleted from the distribution hold list 30b. The distribution hold list 30b still including the image forming apparatus 20 indicates that the image forming apparatus 20 has not been in the ready state yet.

[0057] When the distribution hold list 30b does not include the slave as the distribution destination (N at Step S4), the set value management unit 21a transmits the changed set value to the slave as a target (Step S5).

[0058] Next, based on a response from the slave, the set value management unit 21a determines, whether or not a reflection of the transmitted set value succeeds (Step S6).

[0059] When the reflection succeeds (Y at Step S6), the set value management unit 21a proceeds a process for the next slave.

[0060] When the reflection fails (N at Step S6), the distribution hold list management unit 21b adds a combination of a name of the image forming apparatus 20, for which the reflection has failed, and the changed set value to the distribution hold list 30b, and then updates the distribution hold list 30b (Step S7). After that, the set value management unit 21a proceeds to a process for the next slave.

[0061] After the process for every slave is completed, the set value management unit 21a unlocks the master lock (Step S8).

[0062] The above has described the process of the master, when the set value of the master is changed, and the master distributes the set value.

Flow of Process 2

[0063] Next, the following describes a process of the slave, when the master distributes the changed set value of the master. FIG. 7 illustrates the process of the slave, when the master distributes the changed set value of the master.

[0064] First, the set value management unit 21a determines, whether or not the slave receives the set value transmitted from the master (Step S10).

[0065] When the set value is not received (N at Step S10), the set value management unit 21a returns to Step S10 and then waits.

[0066] When the set value is received (Y at Step S10), the set value management unit 21a reflects the received set value in a setting item as a target (Step S11).

[0067] Next, the set value management unit 21a returns a reflection completion response to the master (Step S12).

[0068] The above has described the process of the slave, when the master distributes the changed set value of the master.

Flow of Process 3

[0069] Next, the following describes a process of the image forming apparatus, where a set value is changed, when the image forming apparatus is the slave, and the image forming apparatus distributes the changed set value after the image forming apparatus has become the master. FIG. 8 illustrates the process of the image forming apparatus, where a set value is changed, when the image forming apparatus is the slave, and the image forming apparatus distributes the changed set value after the image forming apparatus has become the master.

[0070] First, assuming that the user changes a set value of the image forming apparatus 20 as the slave (Step S20).

[0071] Next, the master transfer management unit 21c transmits a master request to the master (Step S21). The master request is a message that requests the master to transfer the master authority.

[0072] Next, the master transfer management unit 21c determines, whether or not the master authority is acquired (Step S22).

[0073] When the master authority is not acquired (N at Step S22), the master transfer management unit 21c returns to Step S21 and transmits the master request again.

[0074] When the master authority is acquired (Y at Step S22), the distribution hold list management unit 21b determines, whether or not the distribution hold list 30b is received from the master (Step S23).

[0075] When the distribution hold list 30b is received (Y at Step S23), the distribution hold list management unit 21b stores the received distribution hold list 30b in the storage unit 30 (Step S24).

[0076] Next, the set value management unit 21a executes a master lock (Step S25).

[0077] Next, the set value management unit 21a repeats a process from Steps S27 to S30 for every slave to which the changed set value is distributed (Step S26).

[0078] The set value management unit 21a determines, whether or not the distribution hold list 30b includes the slave as a distribution destination (Step S27).

[0079] When the distribution hold list 30b includes the distribution destination (Y at Step S27), the set value management unit 21a avoids distributing to the slave, and the distribution hold list management unit 21b adds a combination of a name of the avoided image forming apparatus as the slave and the changed set value to the distribution hold list 30b, and then updates the distribution hold list 30b (Step S30).

[0080] At this time, when the distribution hold list 30b has already included a combination including the identical content, the combination of the name of the avoided image forming apparatus and the changed set value is overwritten, and then the distribution hold list 30b is updated. After that, the set value management unit 21a proceeds to a process for the next slave.

[0081] When the distribution hold list 30b does not include the slave as the distribution destination (N at Step S27), the set value management unit 21a transmits the changed set value to the slave as a target (Step S28).

[0082] Next, based on a response from the slave, the set value management unit 21a determines, whether or not a reflection of the transmitted set value succeeds (Step S29).

[0083] When the reflection succeeds (Y at Step S29), the set value management unit 21a proceeds to a process for the next slave.

[0084] When the reflection fails (N at Step S29), the distribution hold list management unit 21b adds a combination of a name of the image forming apparatus 20, for which the reflection has failed, and the changed set value to the distribution hold list 30b, and then updates the distribution hold list 30b (Step S30). After that, the set value management unit 21a proceeds to a process for the next slave.

[0085] After the processes for all the slaves are completed, the set value management unit 21a unlocks the master lock (Step S31).

[0086] The above has described the process of the image forming apparatus, where that a set value is changed, when the image forming apparatus is the slave, and the image forming apparatus distributes the changed set value after the image forming apparatus has become the master.

Flow of Process 4

[0087] Next, the following describes a process of the image forming apparatus 20 that transitions from the master to the slave due to a change of a set value and a master request by a slave. FIG. 9 illustrates the process of the image forming apparatus 20 that transitions from the master to the slave due to the change of the set value and the master request.

[0088] First, the master transfer management unit 21c determines, whether or not the master request is accepted from the slave that has received the change of the set value (Step S40).

[0089] When the master request is not accepted (N at Step S40), the master transfer management unit 21c returns to Step S40 and then waits.

[0090] When the master request is accepted (Y at Step S40), the master transfer management unit 21c determines, whether or not the own device is in a master lock state (Step S41).

[0091] When the device is in the master lock state (Y at Step S41), the master transfer management unit 21c replies a rejection notification of the master authority transfer to the slave, which has transmitted the master request, and then terminates the process (Step S42).

[0092] When the device is not in the master lock state (N at Step S41), the master transfer management unit 21c transfers the master authority to the slave, which has transmitted the master request (Step S43).

[0093] Next, the master transfer management unit 21c determines, whether or not the distribution hold list 30b, which is stored in the storage unit 30, includes the image forming apparatus 20 for which a distribution is held (Step S44).

[0094] When the distribution hold list 30b includes the image forming apparatus 20 for which the distribution is held (Y at Step S44), the master transfer management unit 21c transmits the distribution hold list 30b to the slave, which has transmitted the master request (Step S45).

[0095] Next, the master transfer management unit 21c changes the own device into a slave setting (Step S46).

[0096] The above has described the process of the image forming apparatus 20 that transitions from the master to the slave due to the change of the set value and the master request.

Flow of Process 5

[0097] Next, the following describes a process of the slave to which the image forming apparatus 20, which has become the master due to the change of the set value, distributes the set value. FIG. 10 illustrates the process of the slave to which the image forming apparatus 20, which has become the master due to the change of the set value, distributes the set value.

[0098] First, the set value management unit 21a determines, whether or not the set value transmitted from the master is received (Step S10).

[0099] When the set value is not received (N at Step S10), the set value management unit 21a returns to Step S10 and then waits.

[0100] When the set value is received (Y at Step S10), the set value management unit 21a reflects the received set value in a setting item as a target (Step S11).

[0101] Next, the set value management unit 21a transmits a reflection completion response to the master (Step S12).

[0102] The above has described the process of the slave to which the image forming apparatus 20, which has become the master due to the change of the set value, distributes the set value.

Flow of Process 6

[0103] Next, the following describes a process of the slave, which has returned to the ready state, receives the set value for which a distribution is held. FIG. 11 illustrates the process of the slave, which has returned to the ready state, receives the set value for which the distribution is held.

[0104] First, assuming that the image forming apparatus 20 as the slave returns to the ready state (Step S50).

[0105] Next, the ready notification management unit 21d in the image forming apparatus 20, which has returned to the ready state, detects that the own device returns to the ready state, and then transmits a ready notification to the master in the network using the above-described method (Step S51).

[0106] Next, the ready notification management unit 21d determines, whether or not a ready response is received from the master (Step S52).

[0107] When the ready response is not received (N at Step S52), the ready notification management unit 21d transmits a ready renotification using the above-described method (Step S53).

[0108] When the ready response is received (Y at Step S52), next, the set value management unit 21a determines, whether or not the set value is received from the master (Step S54).

[0109] When the set value is not received (N at Step S54), the process terminates because the master does not include a held set value regarding the slave.

[0110] When the set value is received (Y at Step S54), the set value management unit 21a reflects the received

set value in the own device (Step S55).

[0111] Next, the set value management unit 21a transmits a reflection completion response to the master (Step S56).

[0112] The above has described the process, where the slave, which has returned to the ready state, receives the set value for which the distribution is held.

Flow of Process 7

[0113] Next, the following describes a process, where the master distributes the set value, for which the distribution is held, to the slave, which has returned to the ready state. FIG. 12 illustrates the process, where the master distributes the set value, for which the distribution is held, to the slave, which has returned to the ready state.

[0114] First, the ready notification management unit 21d as the master determines, whether or not a ready notification is received from the slave, which has returned to the ready state, (Step S60).

[0115] When the ready notification is not received (N at Step S60), the ready notification management unit 21d returns to Step S60 and then waits.

[0116] When the ready notification is received (Y at Step S60), the ready notification management unit 21d transmits a ready response to the slave, which has transmitted the ready notification (Step S61).

[0117] Next, the set value management unit 21a determines, whether or not the distribution hold list 30b includes the image forming apparatus 20, which has transmitted the ready notification (Step S62).

[0118] When the distribution hold list 30b does not include the image forming apparatus 20 (N at Step S62), the process terminates because the distribution hold list 30b does not include a set value to be distributed to the image forming apparatus 20, which has transmitted the ready notification.

[0119] When the distribution hold list 30b includes the image forming apparatus 20 (Y at Step S62), the set value management unit 21a executes a master lock (Step S63). Next, the set value management unit 21a transmits the held set value (Step S64).

[0120] Next, the set value management unit 21a determines, whether or not a reflection of the set value succeeds based on a response from the slave (Step S65).

[0121] When the reflection of the set value succeeds (Y at Step S65), the set value management unit 21a deletes an entry regarding the image forming apparatus 20, which has transmitted the ready notification, from the distribution hold list 30b (Step S66).

[0122] When the reflection of the set value fails (N at Step S65), the set value management unit 21a retains the entry regarding the image forming apparatus 20, which has transmitted the ready notification, in the distribution hold list 30b (no action).

[0123] Next, the set value management unit 21a unlocks the master lock (Step S67). With the embodiment, the image forming apparatus of the disclosure ensures execution of asynchronous information sharing among image forming apparatuses without using a mail server even, when a part of the image forming apparatuses is turned off.

[0124] The above has described the process, where the master distributes the set value, for which the distribution is held, to the slave, which has returned to the ready state.

[0125] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

Claims

1. An image forming apparatus (20) that is adapted to execute information sharing among a plurality of image forming apparatuses (20A, 20B, 20C, 20D), the image forming apparatus (20) comprising:

   - a communication circuit (29) that is adapted to ensure communication with another image forming apparatus of the plurality of the image forming apparatuses (20A, 20B, 20C, 20D);
   - a set value management circuit (21a) that is adapted to distribute, based on a master authority as an authority for distributing a changed set value to the other image forming apparatus, the changed set value to the other image forming apparatus;
   - a storage circuit (30) that, when the distribution fails, is adapted to store a distribution hold list (30b) including a combination of: an identifier of another image forming apparatus (20), where the distribution has failed, and an item name and value of a set value, where the distribution has failed; and
   - a distribution hold list management circuit (21b) that is adapted manage the stored distribution hold list (30b).

2. The image forming apparatus (20) according to claim 1, further comprising

   - a master transfer management circuit (21c) that, when the master transfer management circuit (21c) receives a master request for acquiring the master authority from one image forming apparatus among the other image forming apparatuses in a state, where a set value has been changed at the one image forming apparatus, is adapted to transfer the master authority to the one image forming apparatus,

wherein, when the master transfer management circuit (21c) transfers the master authority to the one image forming apparatus, the master transfer management circuit (21c) is adapted to transmit the distribution hold list (30b) to the one image forming apparatus.

3. The image forming apparatus (20) according to claim 1 or 2, further comprising

- a ready notification management circuit (21d) that is adapted to ensure reception of a ready notification indicating a fact that the other image forming apparatus, where the distribution has failed, returns to a normal state, from the other image forming apparatus, where the distribution has failed,

wherein, when the set value management circuit (21a) receives the ready notification, the set value management circuit (21a) is adapted to determine, whether or not the distribution hold list (30b) includes another image forming apparatus that has transmitted the ready notification, and when the distribution hold list (30b) includes the other image forming apparatus that has transmitted the ready notification, the set value management circuit (21a) is adapted to transmit a set value, where the distribution has been held, to the other image forming apparatus that has transmitted the ready notification.

4. A non-transitory computer-readable recording medium storing an information processing program to control an image forming apparatus (20), the image forming apparatus (20) that is adapted to execute information sharing among a plurality of image forming apparatuses (20A, 20B, 20C, 20D), the information processing program being adapted to cause a computer of the image forming apparatus (20) to operate as:

- a communication circuit (29) that is adapted to ensure communication with another image forming apparatus of the plurality of the image forming apparatuses (20A, 20B, 20C, 20D);
- a set value management circuit (21a) that is adapted to distribute, based on a master authority as an authority for distributing a changed set value to the other image forming apparatus, the changed set value to the other image forming apparatus;
- a storage circuit (30) that, when the distribution fails, is adapted to store a distribution hold list (30b) including a combination of: an identifier of another image forming apparatus, where the distribution has failed, and an item name and value of a set value, where the distribution has failed; and
- a distribution hold list management circuit (21b) that is adapted to manage the stored distribution hold list (30b).

FIG. 1

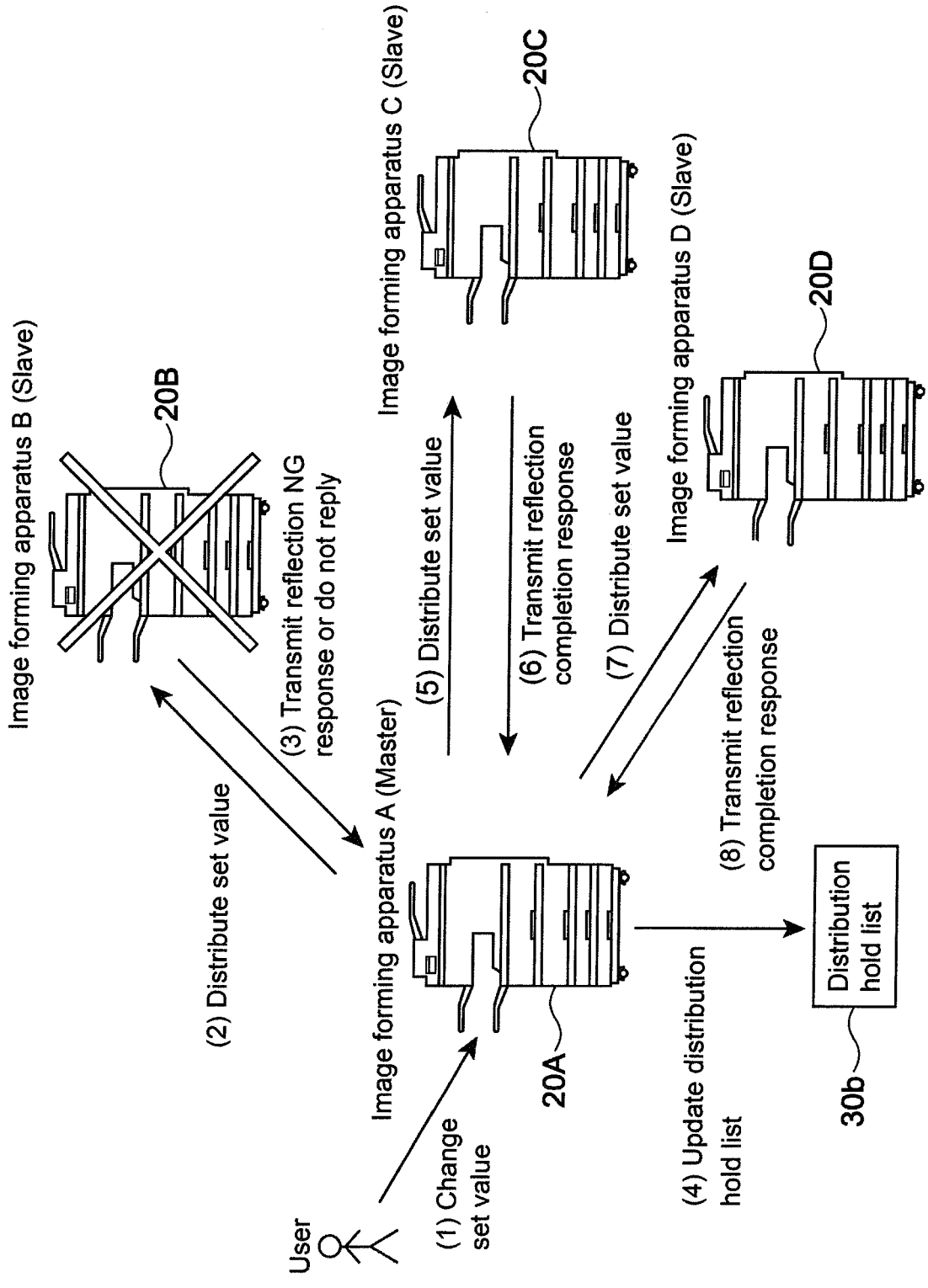


Image forming apparatus B (Slave)
20B
Image forming apparatus C (Slave)
20C
Image forming apparatus D (Slave)
20D
(2) Distribute set value
(3) Transmit reflection NG response or do not reply
(5) Distribute set value
(6) Transmit reflection completion response
(7) Distribute set value
(8) Transmit reflection completion response
Image forming apparatus A (Master)
20A
User
(1) Change set value
(4) Update distribution hold list
Distribution hold list
30b

FIG. 2

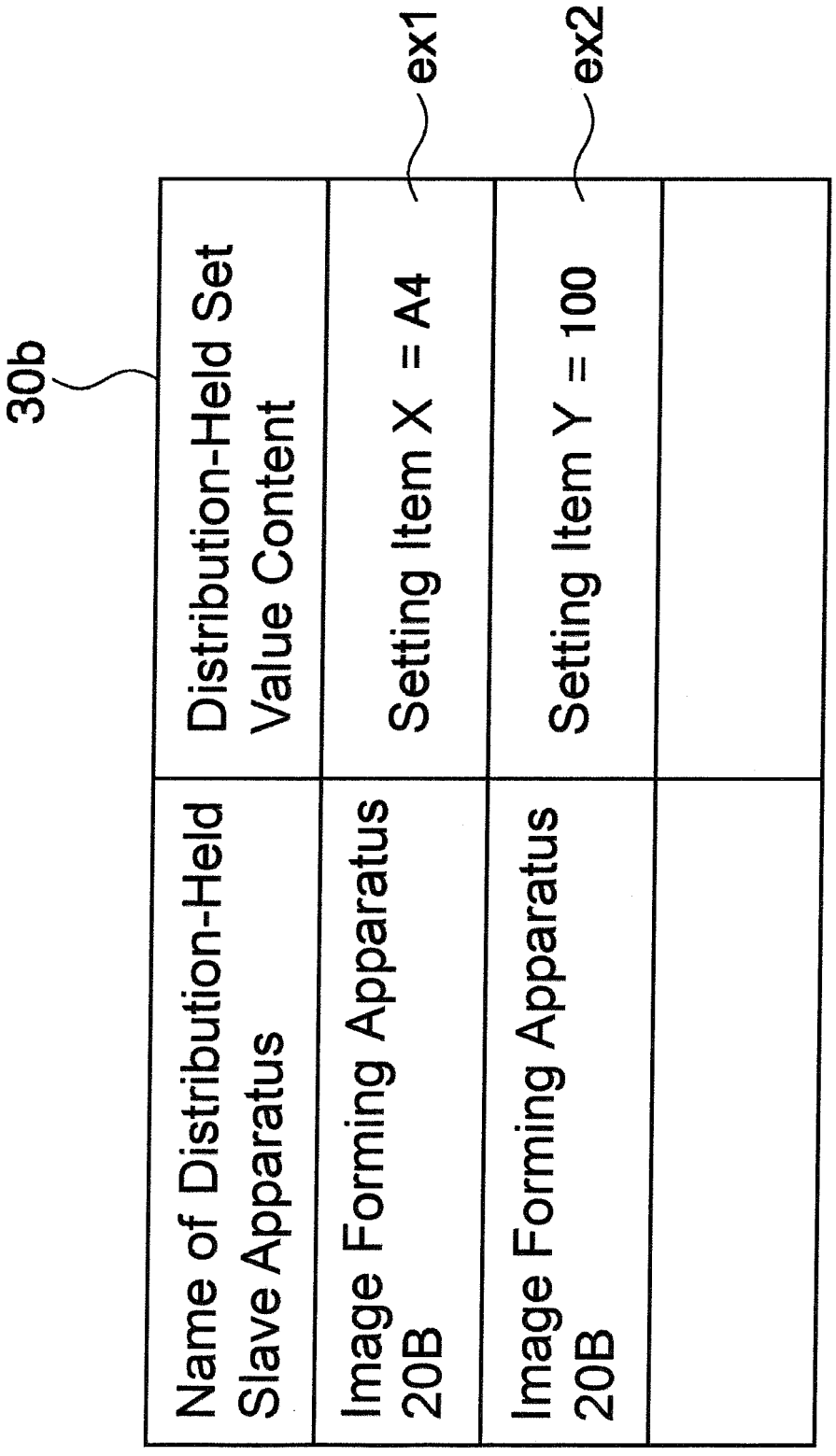

30b
Name of Distribution-Held Slave Apparatus
Distribution-Held Set Value Content
Image Forming Apparatus 20B
Setting Item X = A4
ex1
Image Forming Apparatus 20B
Setting Item Y = 100
ex2

FIG. 3

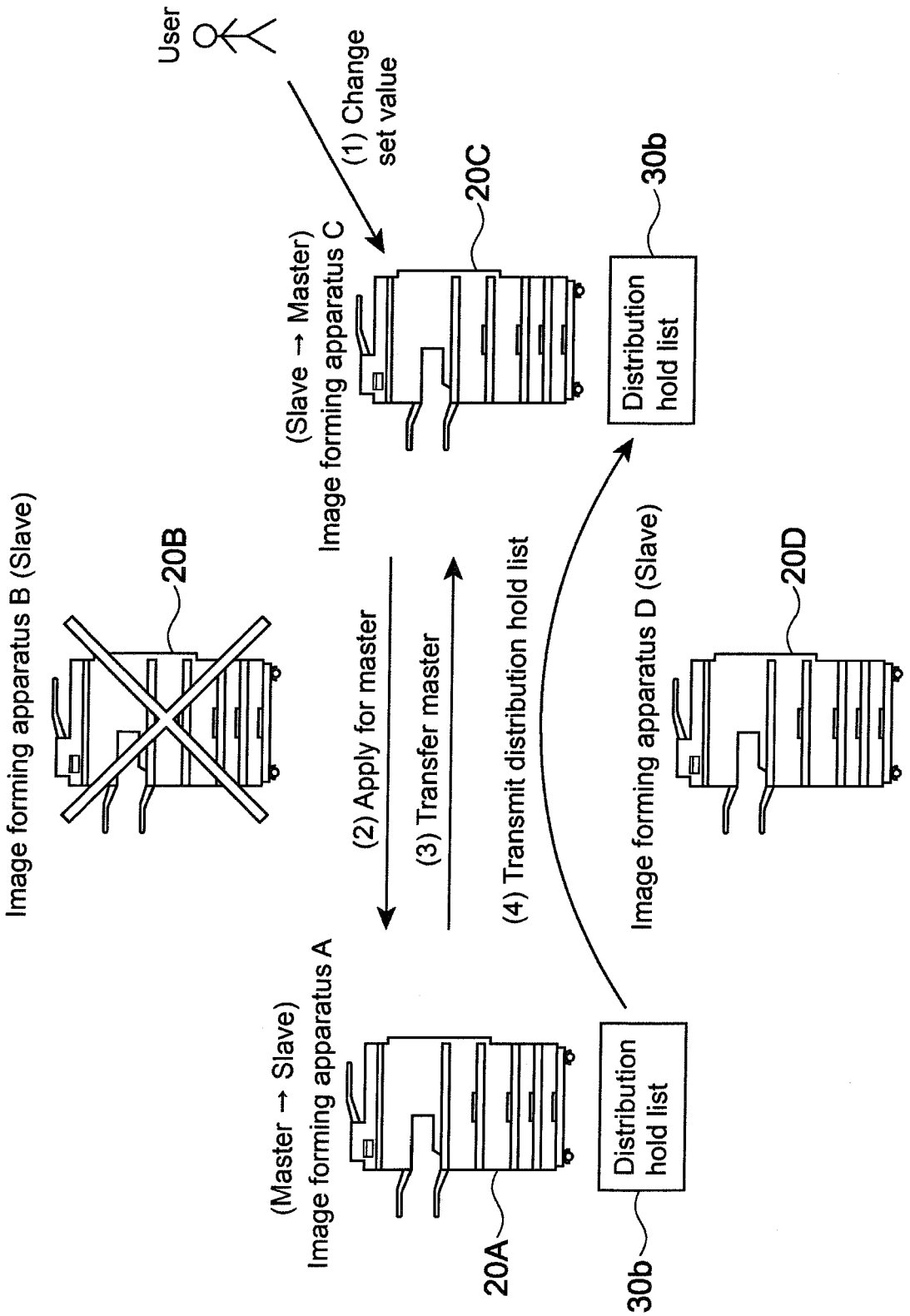

User
(1) Change set value
(Slave → Master)
Image forming apparatus C
20C
30b
Distribution hold list
Image forming apparatus B (Slave)
20B
(2) Apply for master
(3) Transfer master
(4) Transmit distribution hold list
Image forming apparatus D (Slave)
20D
(Master → Slave)
Image forming apparatus A
20A
30b
Distribution hold list

FIG. 4

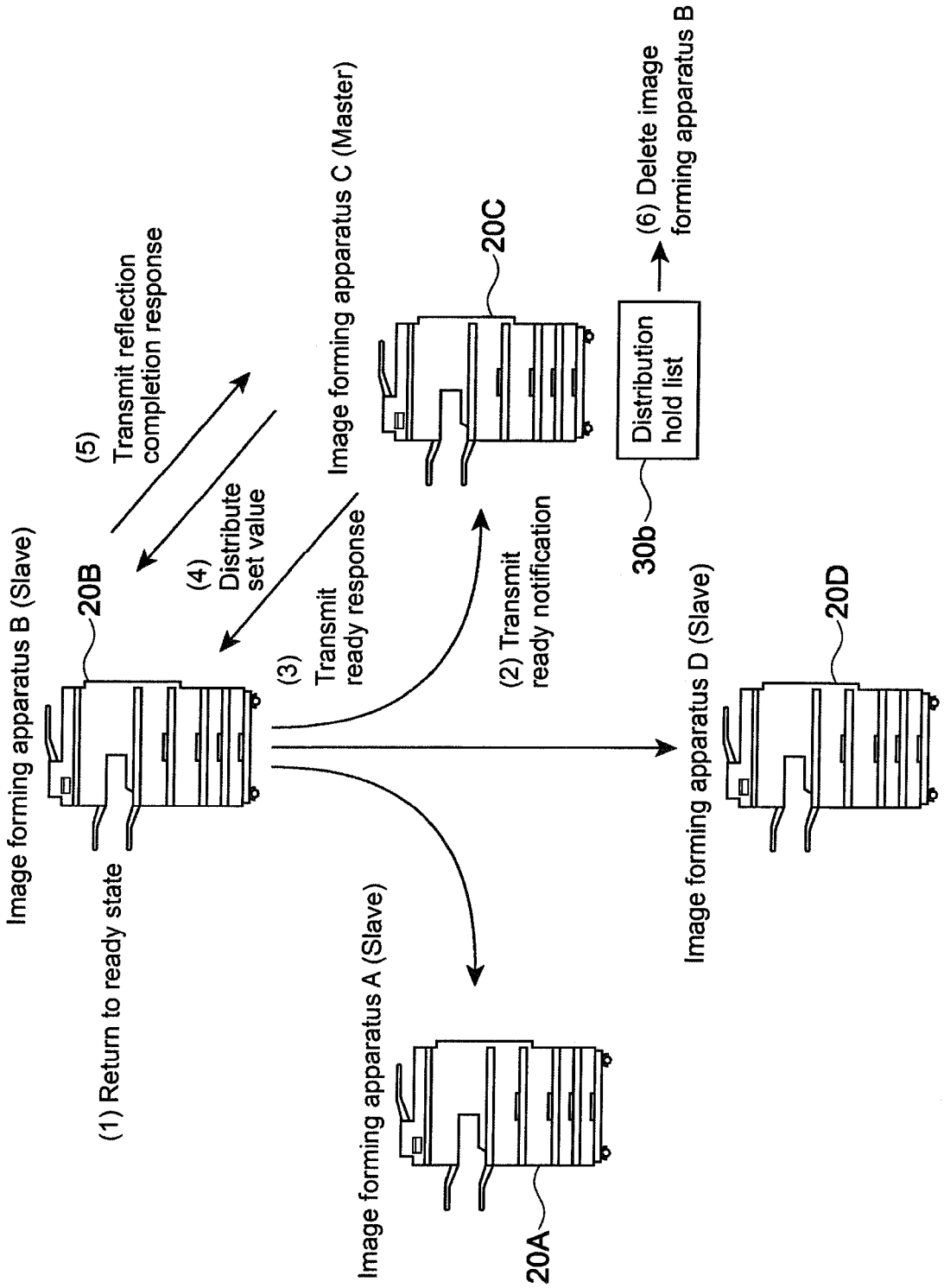


Image forming apparatus B (Slave)
20B
(1) Return to ready state
(5) Transmit reflection completion response
(4) Distribute set value
Image forming apparatus C (Master)
20C
(3) Transmit ready response
(2) Transmit ready notification
Distribution hold list
30b
(6) Delete image forming apparatus B
Image forming apparatus D (Slave)
20D
Image forming apparatus A (Slave)
20A

FIG. 5

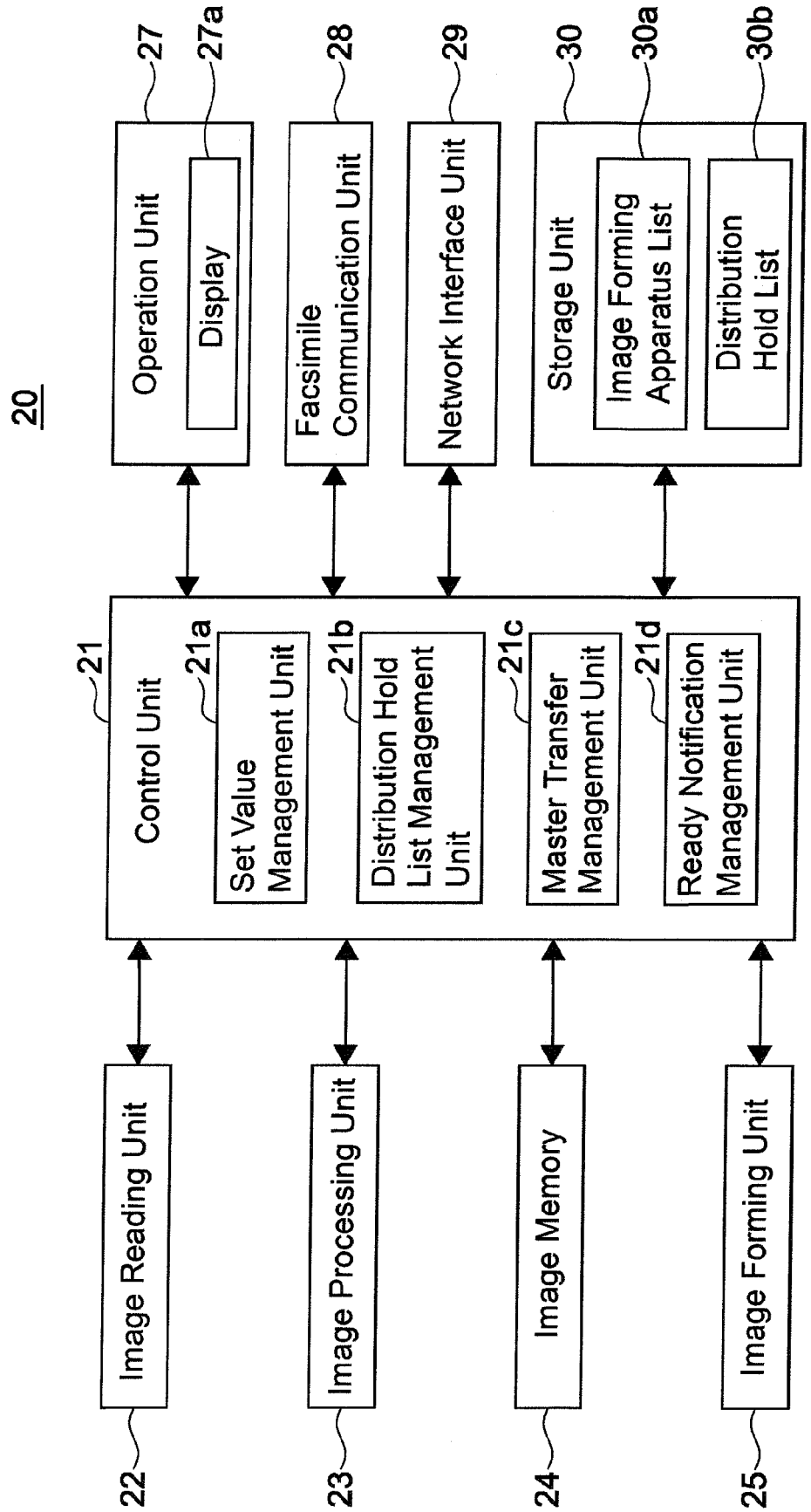

20
Operation Unit
27
Display
27a
Facsimile Communication Unit
28
Network Interface Unit
29
Storage Unit
30
Image Forming Apparatus List
30a
Distribution Hold List
30b
Control Unit
21
Set Value Management Unit
21a
Distribution Hold List Management Unit
21b
Master Transfer Management Unit
21c
Ready Notification Management Unit
21d
Image Reading Unit
22
Image Processing Unit
23
Image Memory
24
Image Forming Unit
25

FIG. 6

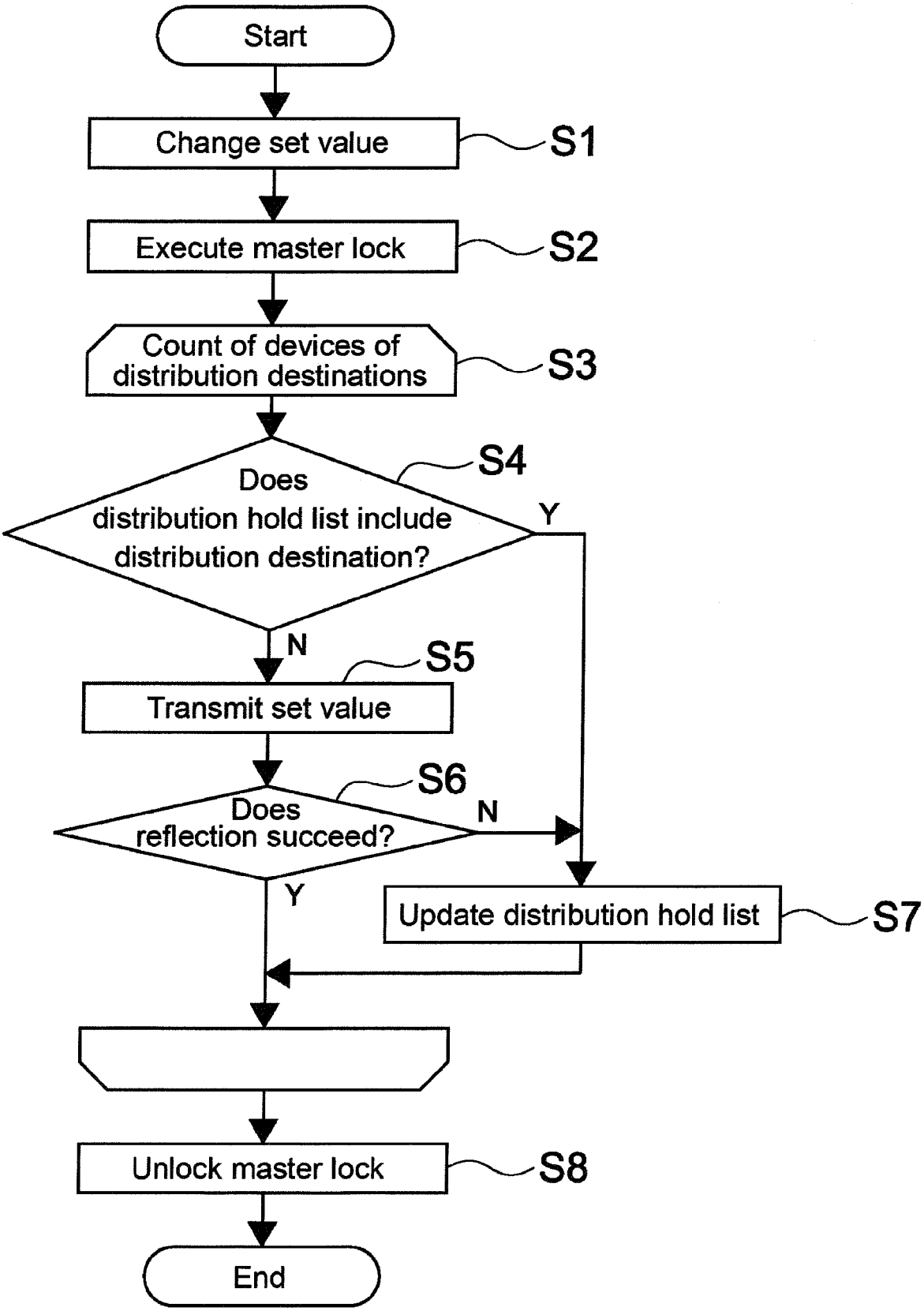

Start
Change set value
S1
Execute master lock
S2
Count of devices of distribution destinations
S3
Does distribution hold list include distribution destination?
S4
Y
N
S5
Transmit set value
S6
Does reflection succeed?
N
Y
Update distribution hold list
S7
Unlock master lock
S8
End

FIG. 7

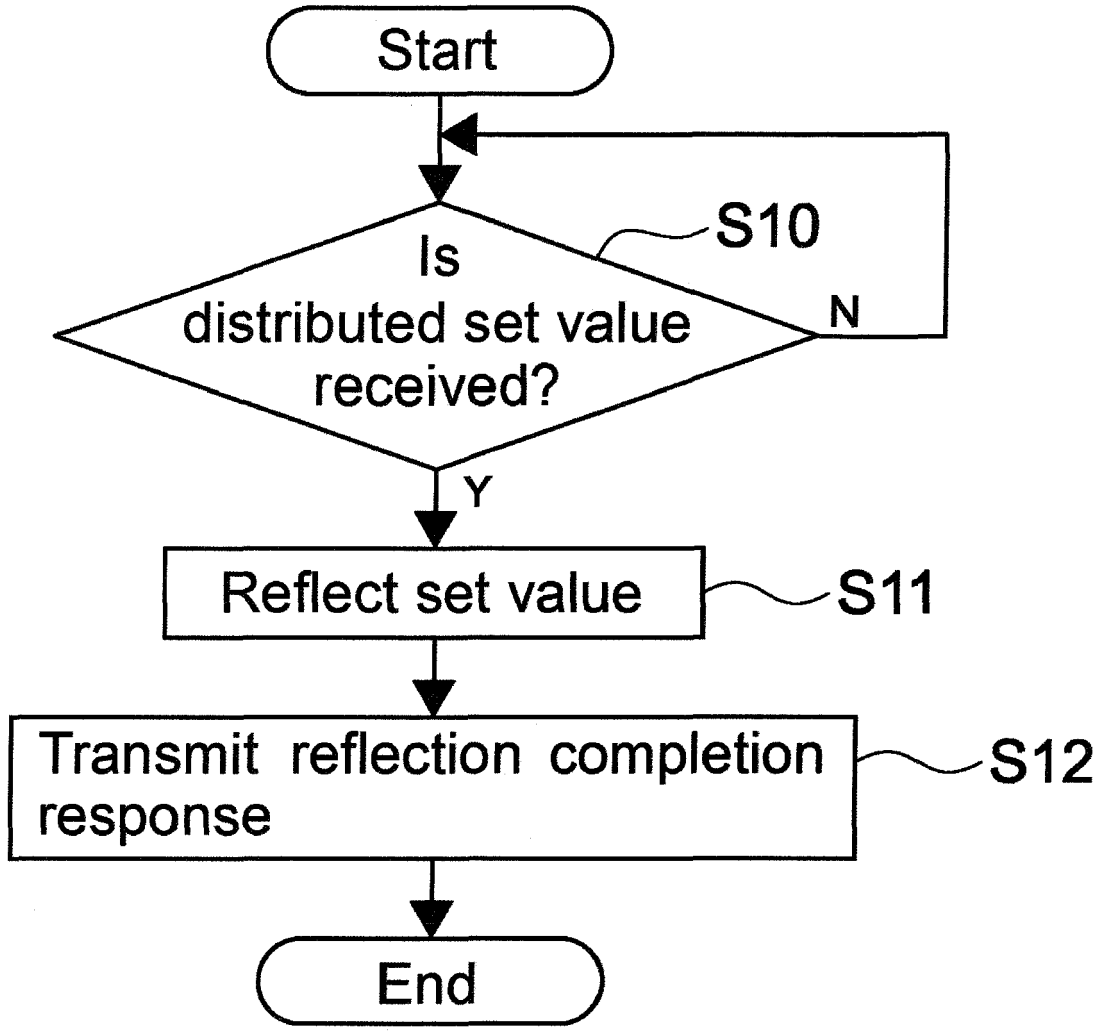

Start
S10
Is distributed set value received?
N
Y
Reflect set value
S11
Transmit reflection completion response
S12
End

FIG. 8

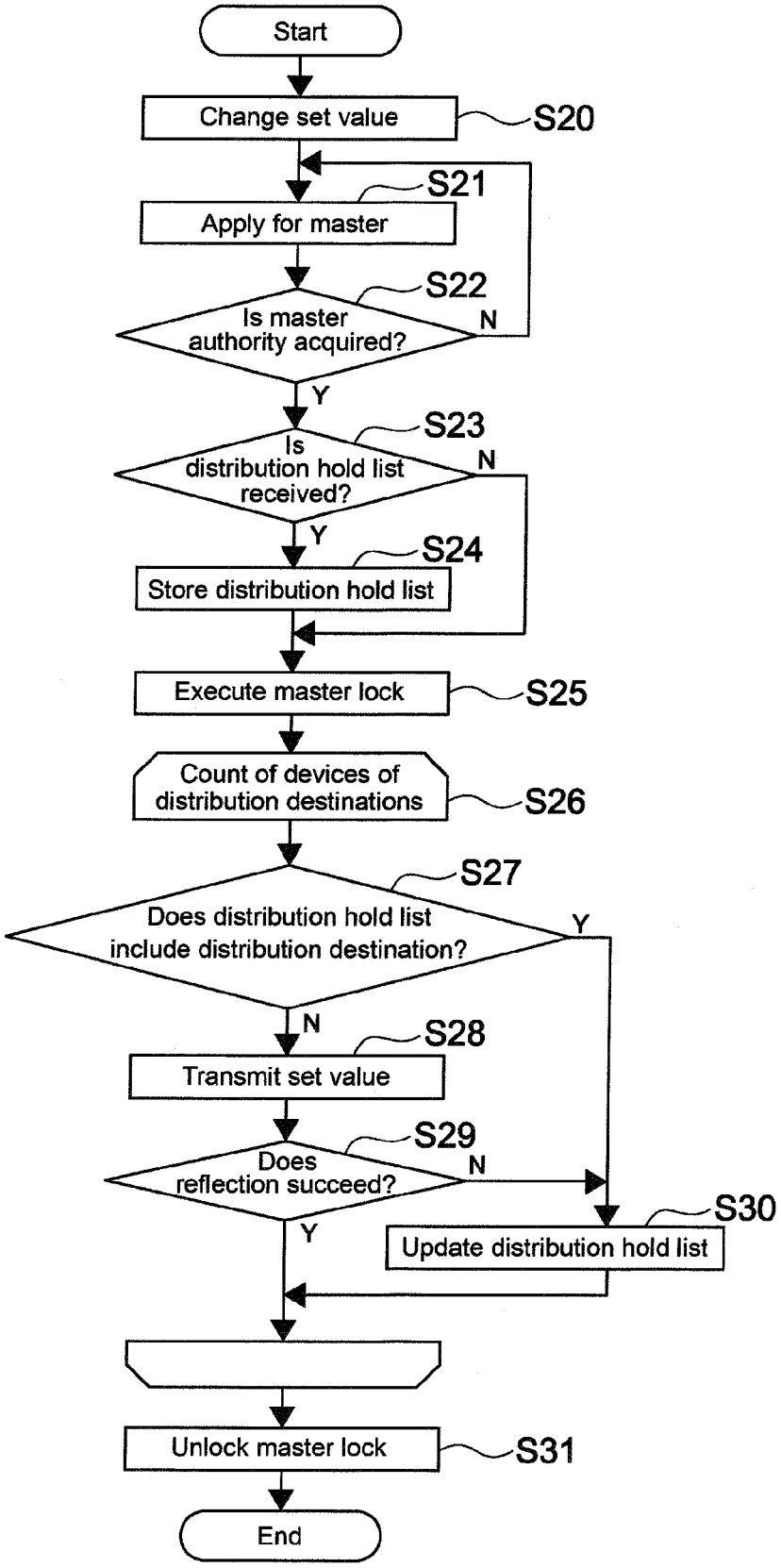

Start
Change set value
S20
S21
Apply for master
S22
Is master authority acquired?
N
Y
S23
Is distribution hold list received?
N
Y
S24
Store distribution hold list
Execute master lock
S25
Count of devices of distribution destinations
S26
S27
Does distribution hold list include distribution destination?
Y
N
S28
Transmit set value
S29
Does reflection succeed?
N
Y
S30
Update distribution hold list
Unlock master lock
S31
End

FIG. 9

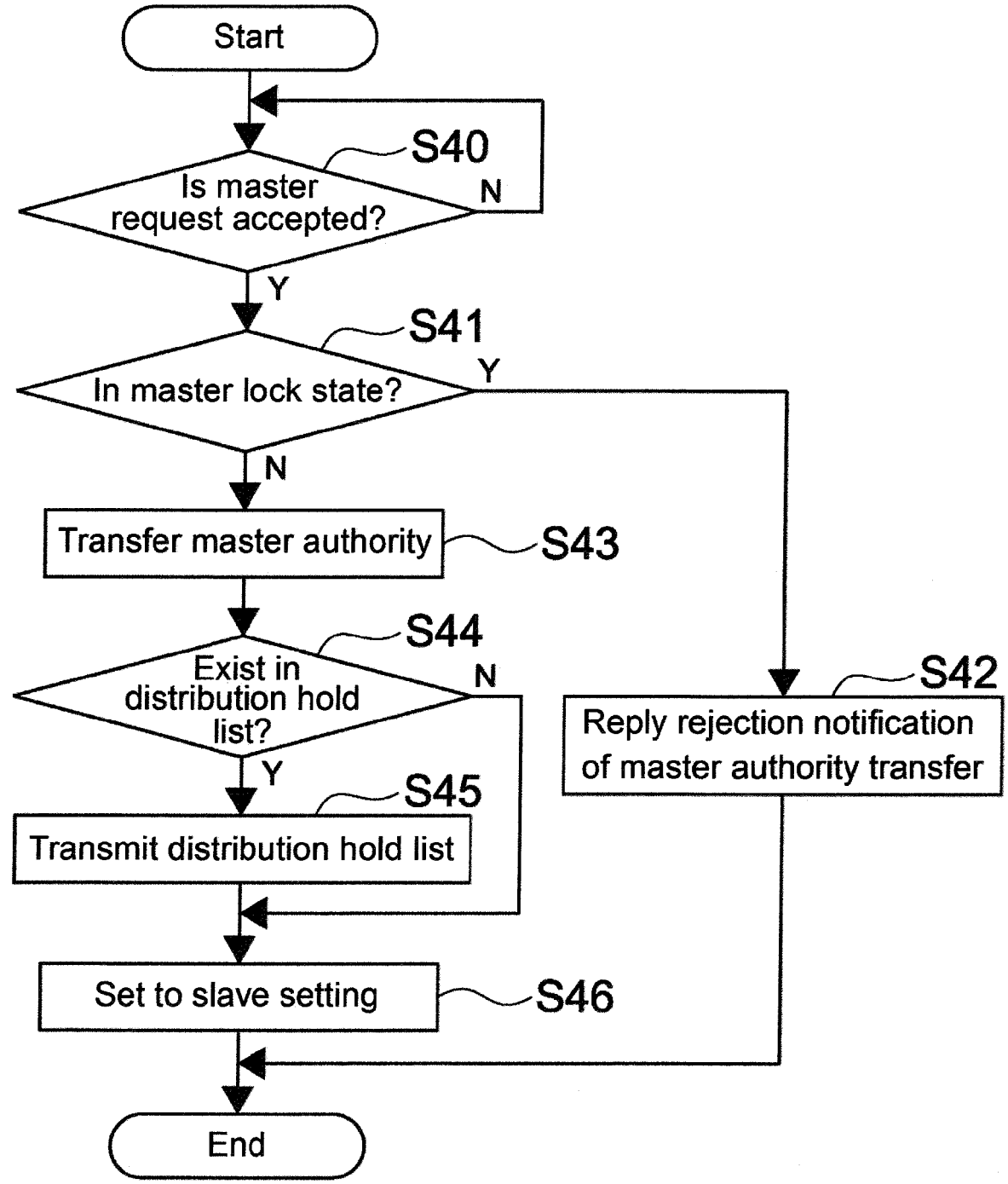

Start
S40
Is master request accepted?
N
Y
S41
In master lock state?
Y
N
Transfer master authority
S43
S44
Exist in distribution hold list?
N
Y
S45
Transmit distribution hold list
S42
Reply rejection notification of master authority transfer
Set to slave setting
S46
End

FIG. 10

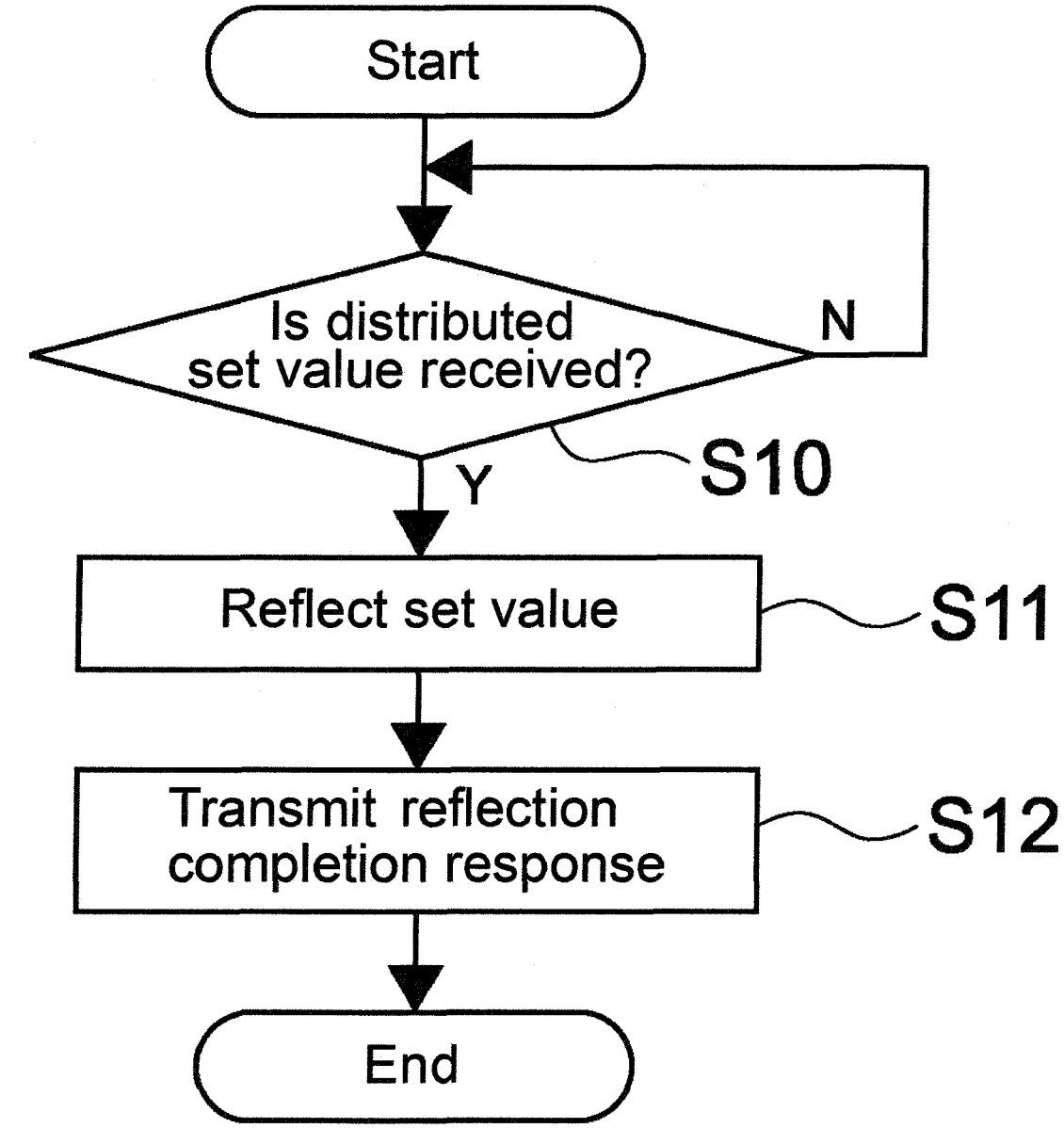

Start
Is distributed set value received?
N
Y
S10
Reflect set value
S11
Transmit reflection completion response
S12
End

FIG. 11

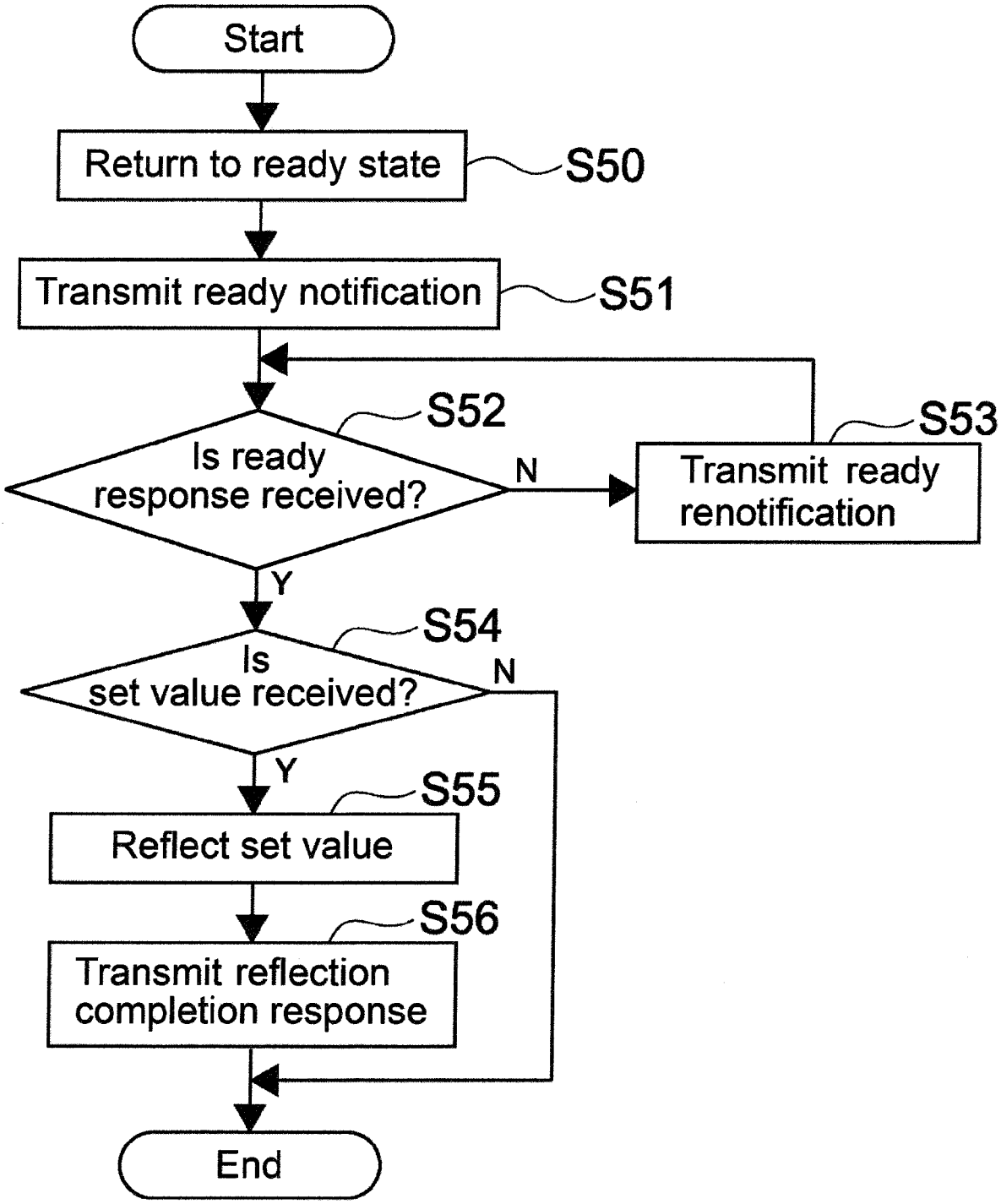
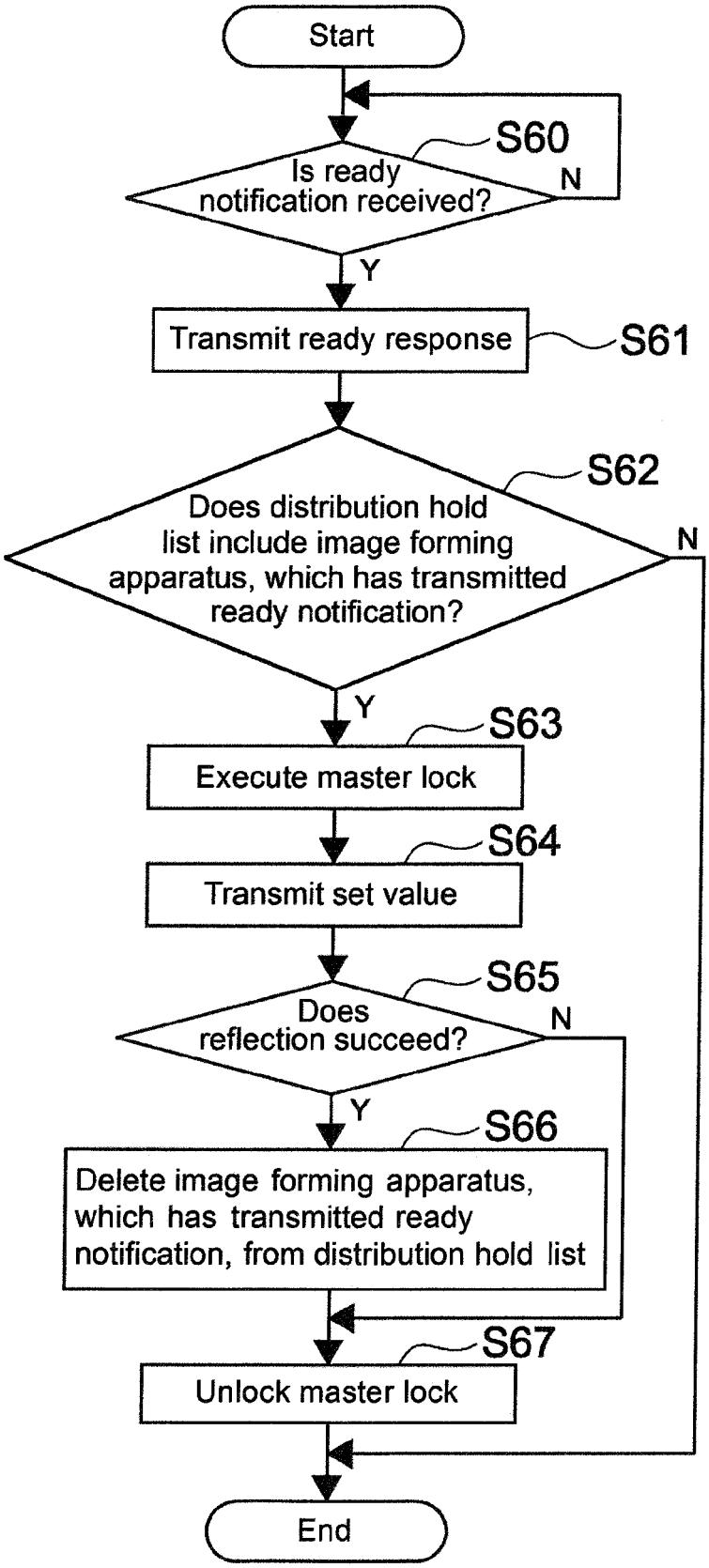

Start
Return to ready state
S50
Transmit ready notification
S51
S52
Is ready response received?
N
S53
Transmit ready renotification
Y
S54
Is set value received?
N
Y
S55
Reflect set value
S56
Transmit reflection completion response
End

FIG. 12


Start
S60
Is ready notification received?
N
Y
Transmit ready response
S61
S62
Does distribution hold list include image forming apparatus, which has transmitted ready notification?
N
Y
S63
Execute master lock
S64
Transmit set value
S65
Does reflection succeed?
N
Y
S66
Delete image forming apparatus, which has transmitted ready notification, from distribution hold list
S67
Unlock master lock
End

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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 1761

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 November 2016	Moorhouse, David

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